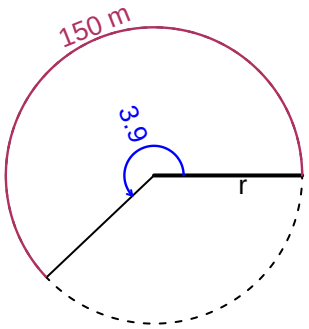
Name: Date:

Trig Final (SLTN v619)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 3.9 radians. The arc length is 150 meters. How long is the radius in meters?

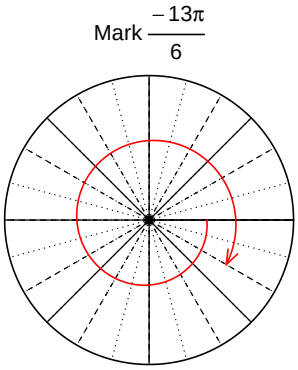


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

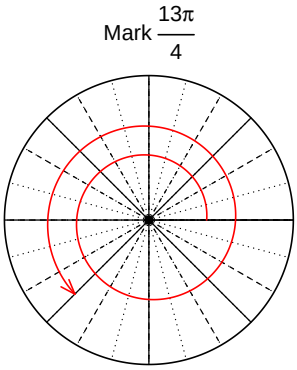
$r = 38.46$ meters.

Question 2

Consider angles $\frac{-13\pi}{6}$ and $\frac{13\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-13\pi}{6}\right)$ and $\sin\left(\frac{13\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\cos(-13\pi/6)$



Find $\sin(13\pi/4)$

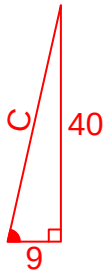
$\cos(-13\pi/6) = \frac{\sqrt{3}}{2}$

$\sin(13\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\tan(\theta) = \frac{40}{9}$, and θ is in quadrant III, determine an exact value for $\sin(\theta)$.

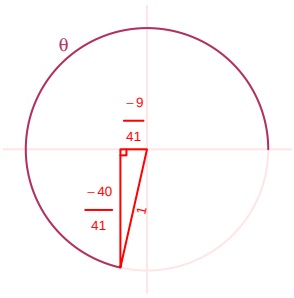
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$9^2 + 40^2 = C^2$$
$$C = \sqrt{9^2 + 40^2}$$
$$C = 41$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\sin(\theta) = \frac{-40}{41}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = 5.4$ meters, a frequency of 6.6 Hz, and an amplitude of 3.34 meters. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -3.34\cos(2\pi 6.6t) + 5.4$$

or

$$y = -3.34\cos(13.2\pi t) + 5.4$$

or

$$y = -3.34\cos(41.47t) + 5.4$$